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International Bureau

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(33) Priority County: AU

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(74) Agent: CLEMENT HACK & CO.; 140 William Street, Melbourne, VIC 3000 (AU).

(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.

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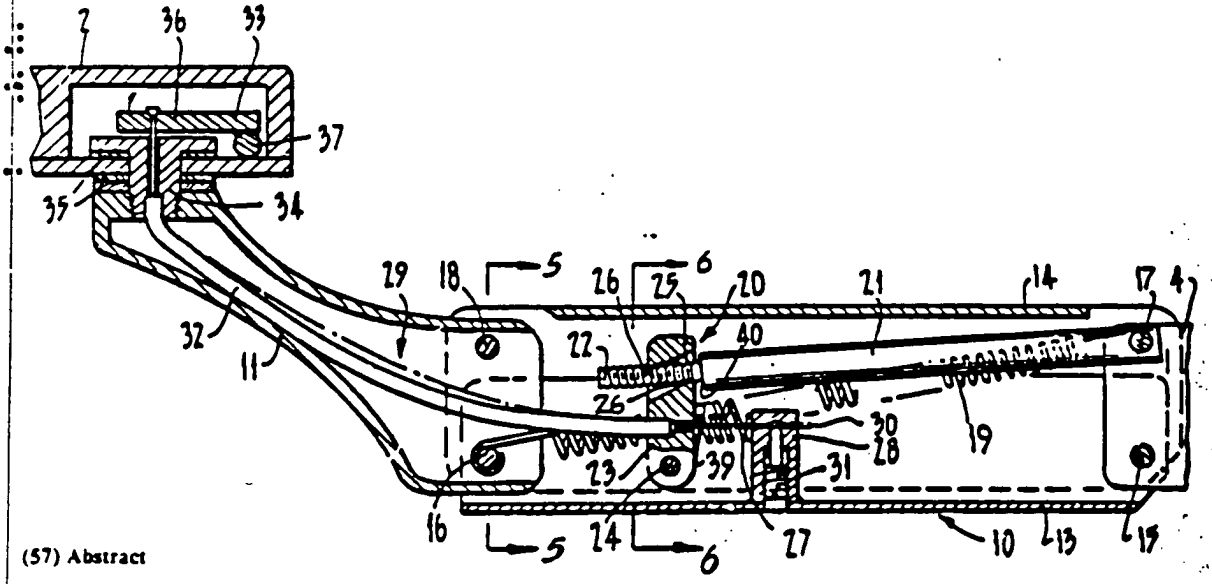
(54) Title: HEIGHT ADJUSTABLE SUPPORT ARM



(57) Abstract

A height adjustable support arm preferably for use in mounting a separate work surface relative to a table top and comprising a boom (10) having two support members (13, 14) independently mounted at one end about parallel pivot pins (15, 17) for movement one above the other, a bracket (11) pivotally mounted (at 16, 18) about parallel axes to the other end of the support members, springs (19) biasing the other end of the lower support member towards the one end of the upper support member and locking means (20) to secure the boom at the desired height with the locking means being in the form of a serrated rod (21) which engages with a pivoted nut (23) which is biased so that a passage (25) in the nut through which the rod passes is normally misaligned with the rod and thereby engages the rod. Release means (29) is actuatable to adjust the disposition of the nut.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A height adjustable support arm comprising a mounting member, boom means comprising two support members independently mounted at one end to the mounting member about parallel pivot axes for upwards and downwards pivotal movement one above the other, a support bracket pivotally mounted to each of the support members at their opposite end about pivot axes that are parallel to the first mentioned pivot axes whereby the support members must perform the upward and downward movement concurrently to raise and lower the support bracket relative to the mounting member, means biasing the opposite end of the lower of the support members towards the one end of the upper of the support members whereby the boom means is biased to raise the support bracket relative to the mounting member, locking means carried by the boom means to maintain the support bracket at a selected height and release means actuatable to disengage the locking means.

2. A support arm according to claim 1 wherein the locking means comprises a longitudinally serrated rod carried by one of the support members and a correspondingly internally formed nut engageable with the rod, with the corresponding formations in the nut being formed in a passage through the nut which is of oversized dimensions compared to the longitudinally serrated rod, and wherein the nut is pivotally mounted on the other of the support members about an axis perpendicular to the axis of the rod whereby the nut can be pivoted between a locking position in which the axis of the passage is aligned with the axis of the rod and in which the serrations on the rod are engaged by the corresponding formations at opposite ends of the passage through the nut, and a release position in which the axes of the passage and of the rod are substantially parallel whereby the rod may be readily moved through the passage.

3. A support arm according to claim 2 wherein the nut is biased into the locking position and the release means is actuatable to move the nut into the release position.

4. A support arm according to claim 2 or claim 3 wherein the serrations on the rod and the corresponding formations in the passage comprise screw-threads.

5. A support arm according to claim 4 wherein one or both the screw-threads are discontinuous.

6. A support arm according to any one of claims 2 to 5 wherein the locking means comprises a ratchet mechanism whereby a greater than predetermined downwards pressure applied to the support bracket overrides the biasing means and the locking means.

7. A support arm according to any one of the preceding claims wherein the support members comprise upper and lower elongate U-shaped channels, with the lower channel opening upwardly and the upper channel being of larger cross-section than the lower channel and opening downwardly to partly overlie and define a housing with the lower channel.

8. A support arm according to claim 7 wherein the biasing means comprises at least one coil spring disposed in the housing and extending under tension between the one end of the upper channel and the opposite end of the lower channel.

9. A support arm according to any one of the preceding claims wherein the mounting member is pivotally mounted about a vertical axis.

10. A support arm according to claim 9 wherein the mounting member is pivotally mounted about said vertical axis to a carriage having rollers rotatable in a guide track.

11. A support arm according to any one of the preceding claims wherein the support bracket includes a vertical pivot support to receive a work surface in rotatable manner.

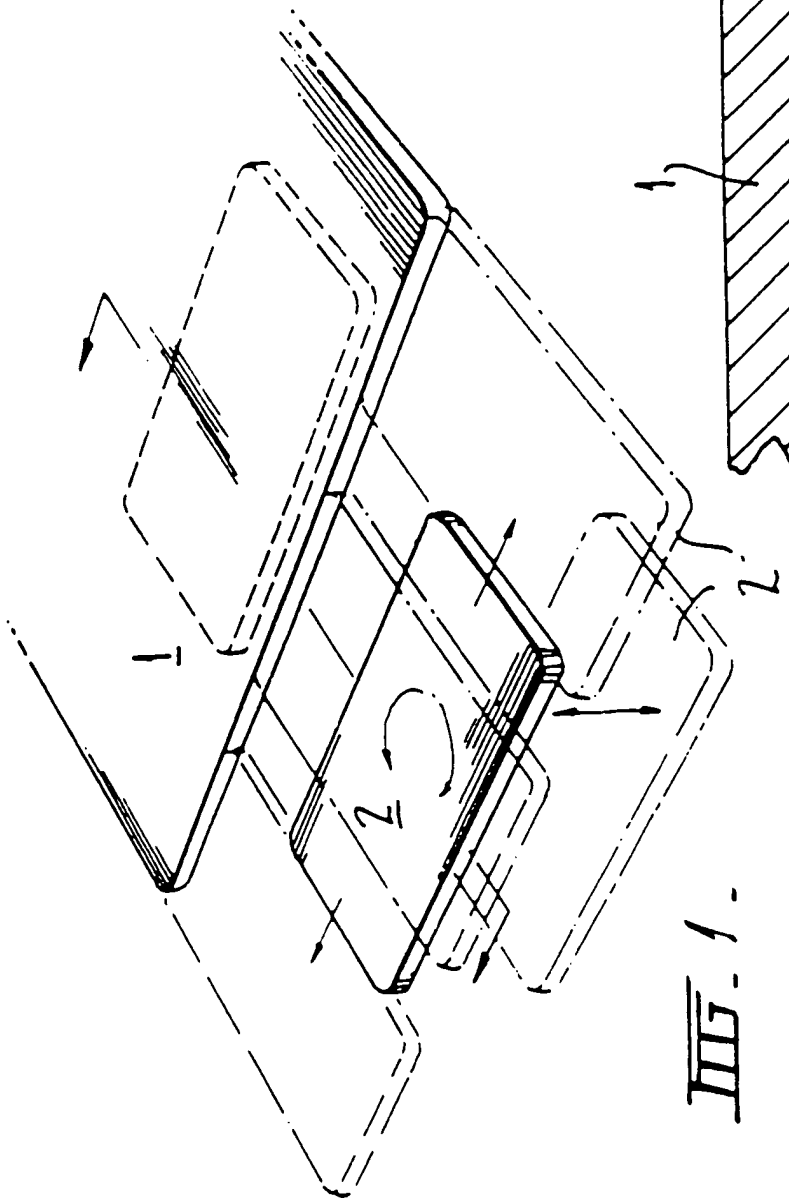


FIG. 1.

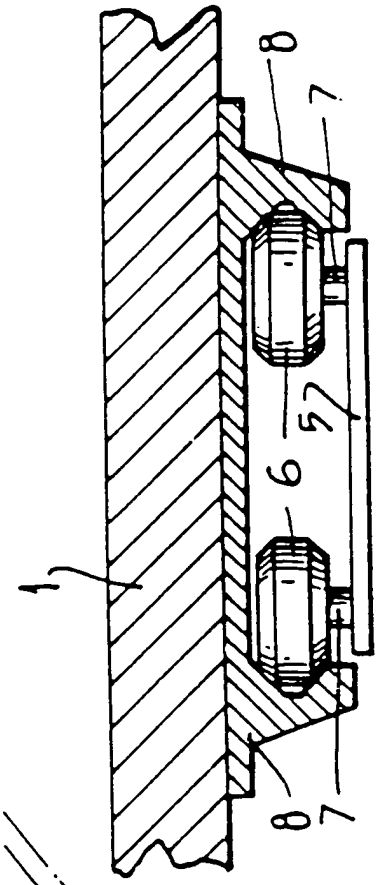


FIG. 8.

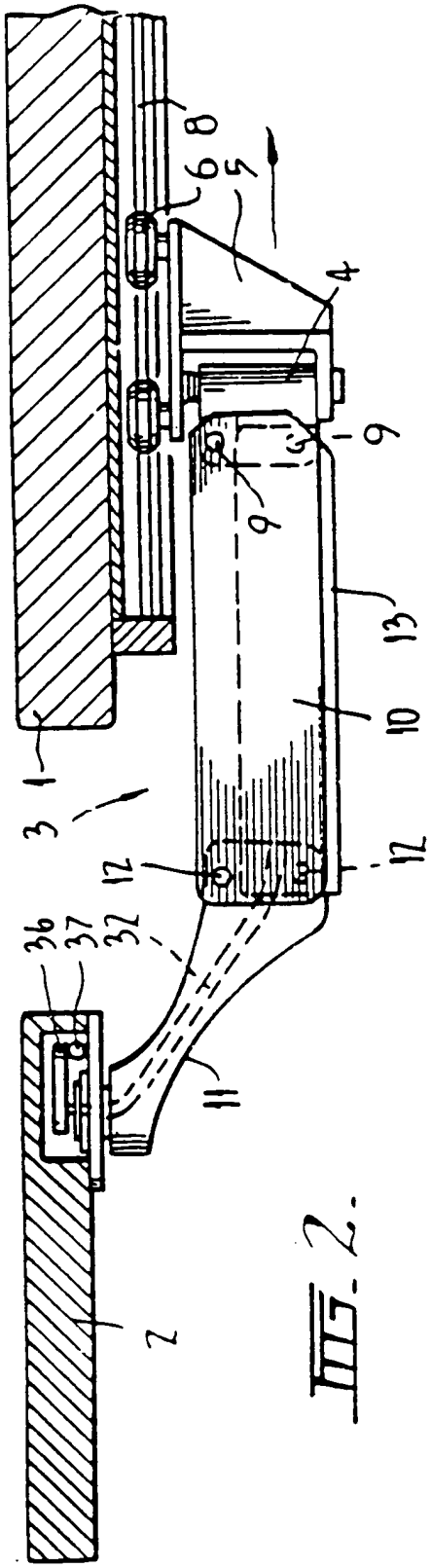


Fig. 2.

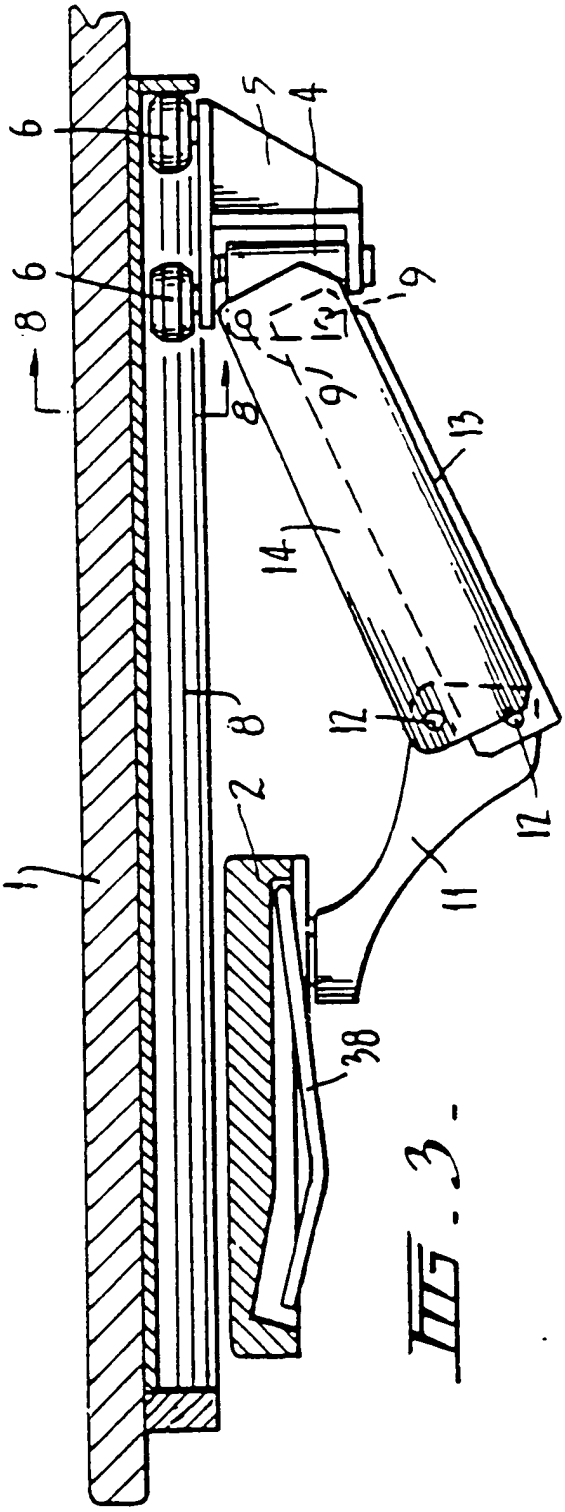


Fig. 3.

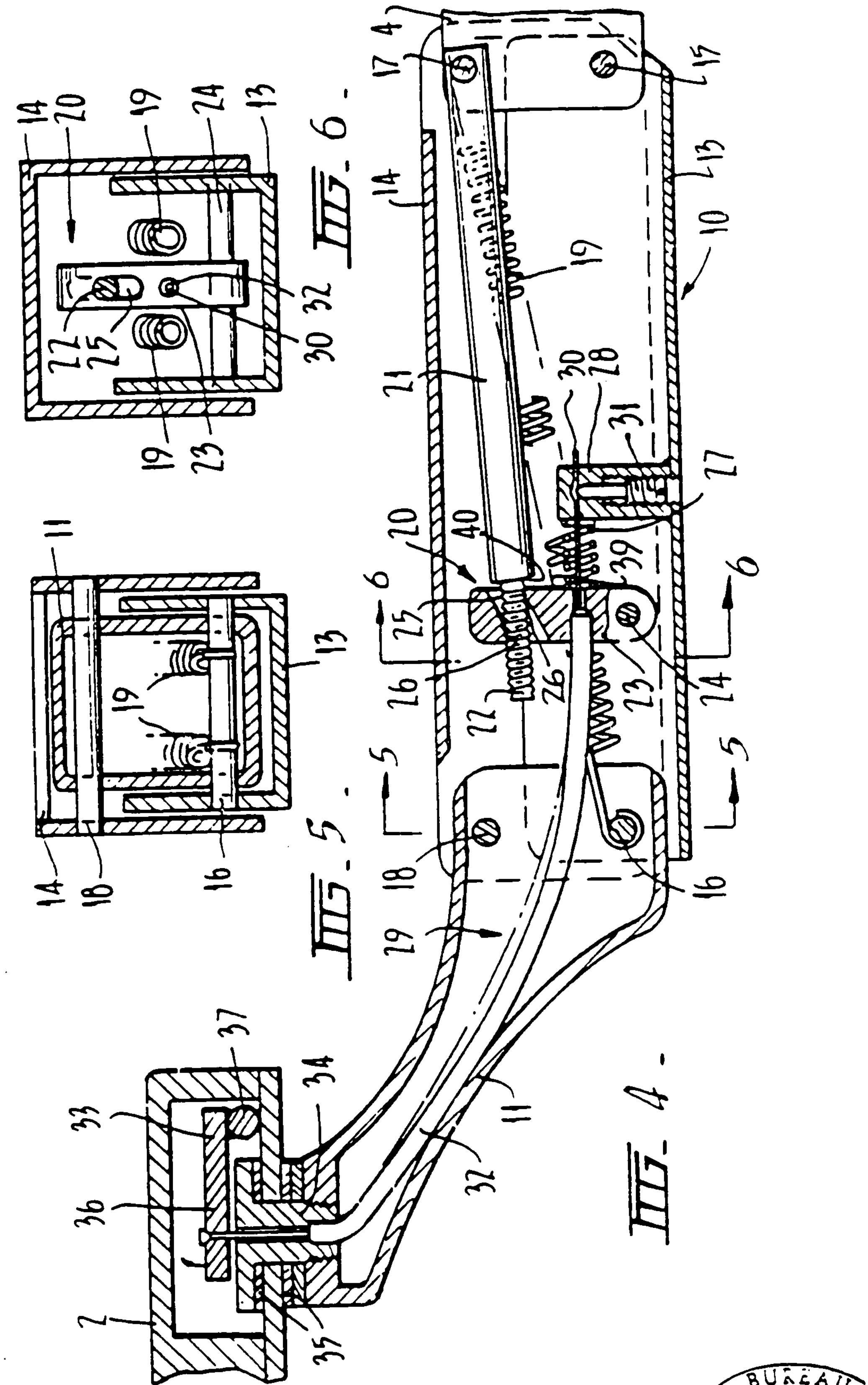


FIG. 4 FIG. 5 FIG. 6

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PATENT OFFICE

(71) Applicant *(for all designated States except US)*: DATA DECOR PTY. LTD. [AU/AU]; Waterloo Place, Richmond, VIC 3121 (AU).

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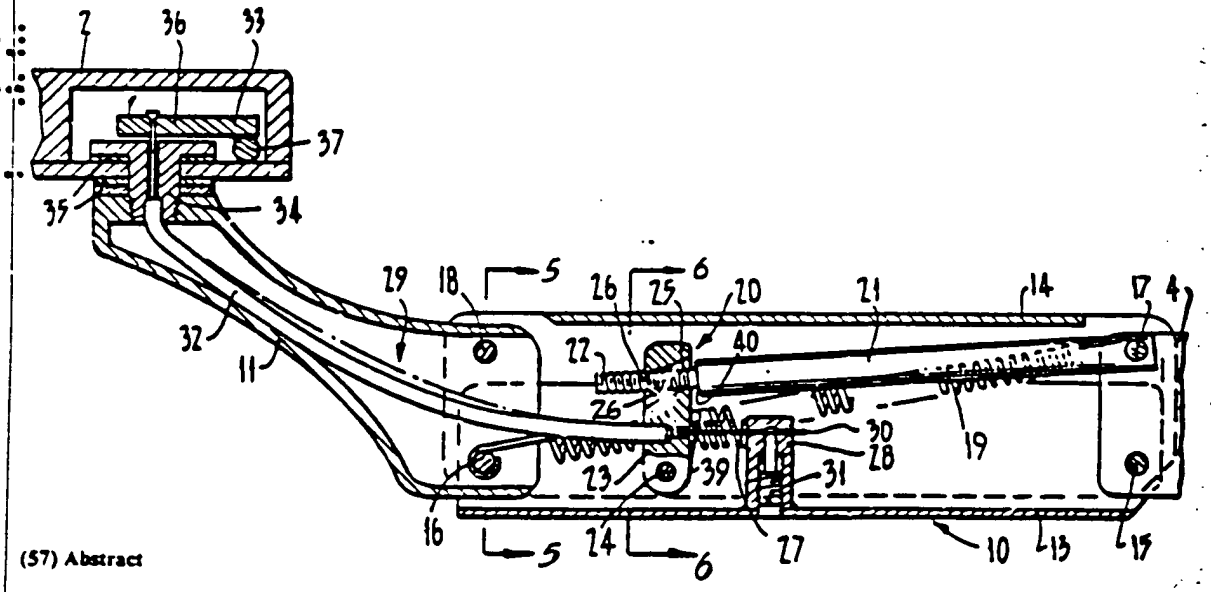
(54) Title: HEIGHT ADJUSTABLE SUPPORT ARM



(57) Abstract

A height adjustable support arm preferably for use in mounting a separate work surface relative to a table top and comprising a boom (10) having two support members (13, 14) independently mounted at one end about parallel pivot pins (15, 17) for movement one above the other, a bracket (11) pivotally mounted (at 16, 18) about parallel axes to the other end of the support members, springs (19) biasing the other end of the lower support member towards the one end of the upper support member and locking means (20) to secure the boom at the desired height with the locking means being in the form of a serrated rod (21) which engages with a pivoted nut (23) which is biased so that a passage (25) in the nut through which the rod passes is normally misaligned with the rod and thereby engages the rod. Release means (29) is actuatable to adjust the disposition of the nut.

HEIGHT ADJUSTABLE SUPPORT ARM

The present invention relates to height adjustable support arms and is particularly, but not only, concerned with a table having a separate work surface mounted thereto whose height is adjustable relative to the tabletop.

Over many years there have been numerous proposals for providing tables with work surfaces that are adjustable as to height in order to satisfactorily accommodate people of different sizes and different uses. The tables having separate work surfaces which are adjustable as to height have particularly come to the

fore with the introduction of tabletop computers and similar electronic apparatus in which medical advantages have been found to accrue from having for example a display screen at a different height to a keyboard.

According to the present invention there is provided a height adjustable support arm comprising a mounting member, boom means comprising two support members independently mounted at one end to the mounting member about parallel pivot axes for upwards and downwards pivotal movement one above the other, a support bracket pivotally mounted to each of the support members at their opposite end about pivot axes that are parallel to the first mentioned pivot axes whereby the support members must perform the upward and downward movement concurrently to raise and lower the support bracket relative to the mounting member, means biasing the opposite end of the lower of the support members towards the one end of the upper of the support members whereby the boom means is biased to raise the support bracket relative to the mounting member, locking means carried by the boom means to maintain the support bracket at a selected height and release means actuatable to disengage the locking means.

In a preferred embodiment, the locking means comprises a longitudinally serrated rod carried by one of the support members and a correspondingly internally formed nut engageable with the rod. The corresponding formations in the nut are formed in a passage through the nut which is of oversized dimensions compared to the longitudinally serrated rod and the nut is pivotally mounted on the other of the support members about an axis perpendicular to the axis of the rod whereby the nut can be pivoted between a locking position in which the axis of the passage is misaligned with the axis of the rod and in which the serrations on the rod are engaged by the

corresponding formations at opposite ends of the passage through the nut, and a release position in which the axes of the passage and of the rod are substantially parallel whereby the rod may be readily moved through the passage. The nut is preferably biased into the locking position and the release means is actuatable to move the nut into the release position. Conveniently, the serrations on the rod and the corresponding formations in the passage comprise screw-threads, but the screw-thread in the passage need only be sufficient to ensure locking engagement with the rod in the locking position.

Accordingly the locking means prevents upward displacement of the support bracket relative to the mounting means when the locking nut is in its locking position, and preferably the locking means is in the form of a ratchet arrangement whereby it is not necessary to actuate the release means to lower the support bracket relative to the mounting member. Thus manually applied downwards pressure on the support bracket may cause the support bracket to lower, but advantageously the upwards biasing caused by the biasing means, which is preferably in the form of at least one tensioned coil spring, and the frictional resistance in the locking means is such that the downwards force to be applied to the support bracket must be greater than would normally be applied during use. Thus, the downwards force must be greater than, for example, the mass of a keyboard and any other such mass usually applied to the support bracket. In the preferred embodiment, the aforementioned ratchet means may be such that the screw-threads in the nut slide over the screw-threads on the rod to permit the downwards movement of the support bracket.

Alternatively the ratchet mechanism may be designed such that it permits upwards movement of the support bracket, with downwards movement only being allowed when the locking means is released.

One embodiment of a support arm in accordance with the present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a perspective view from above of a tabletop and work surface which are connected by the support arm;

Figure 2 is a side view showing the work surface at its maximum height relative to the tabletop;

Figure 3 is a view similar to Figure 2 but showing the work surface stored beneath the tabletop;

Figure 4 is an enlarged sectional view of part of Figure 2 showing the internal arrangement of the support arm;

Figure 5 is a sectional view along the line 5-5 of Figure 4;

Figure 6 is a sectional view along the line 6-6 of Figure 4;

Figure 7 is a view of the tabletop, support arm and work surface of Figure 2 from below, partly in section; and

Figure 8 is a sectional view along the line 8-8 in Figure 3.

The table shown in Figure 1 comprises a tabletop 1 and a work surface 2 which is moveable from a retracted position beneath the tabletop shown in dotted lines to an extended position shown in continuous lines by means of a support arm to be described in greater detail hereinafter. In the extended position, the work surface is rotatable through 360° about its own axis, is displaceable sideways relative to the tabletop and is moveable upwards and downwards relative to the tabletop.

Referring now to Figures 2, 7 and 8, the support arm 3 comprises a mounting member 4 which is pivotally mounted about a vertical axis to a carriage 5 which carries rollers 6 rotatable about vertical axles 7 in a guide track 8 mounted on the lower surface of the tabletop 1.

Pivotally mounted to the mounting member 4 about horizontal axes 9, and in a manner to be described in greater detail hereinafter, is a boom 10. A support bracket 11 is pivotally mounted about axes 12 to the opposite end of the boom to the axes 9, also in a manner to be described in greater detail hereinafter. The work surface 2 is pivotally mounted to the remote end of the bracket 11 for rotation about a vertical axis. In summary, the carriage 5 may be displaced along the track 8 to extend and retract the work surface 2, the boom 10 may be pivoted relative to the carriage 5 about a vertical axis and the work surface 2 may be pivoted relative to the support bracket 11 also about a vertical axis. In addition, the work surface 2 is moveable upwardly and downwardly relative to the tabletop 1 by pivotally movement about the horizontal axes 9 and 12.

As indicated in Figure 2, when the work surface 2 is raised to its maximum height 1, with the upper surfaces of each aligned, the horizontal axes 9 are vertically spaced from each other, and the horizontal axes 12 are also vertically spaced from each other. Referring now to Figure 3, which shows the work surface in a lowered position, the boom 10 is arranged such that the horizontal axes 9 are still vertically spaced from each other, as are the horizontal axes 12. Thus the boom 10 defines a parallelogram arrangement between the axes 9 and 12 whereby the upper surface of the work surface 2 is maintained at the desired angle, horizontal as shown in the figures.

Referring now to Figures 4 to 7, the boom 10 comprises a lower elongate U-shaped channel 13 which opens upwardly and an upper elongate U-shaped channel 14 which is of larger cross-section than the lower channel 13 and opens downwardly to partly overlie the lower channel. The lower channel 13 is pivotally engaged with the mounting member 4 by means of an axle 15 which defines the lower horizontal axis 9 and is pivotally engaged with the support bracket 11 by a pivot axle 16 which defines the lower horizontal axis 12. Correspondingly, the upper channel is pivotally engaged with the mounting member 4 by a pivot axle 17 which defines the upper horizontal pivot axis 9 and with the support bracket 11 by a pivot axle 18 which defines the upper horizontal axis 12.

The boom 10 is biased upwardly relative to the mounting member 4 by a pair of tensioned coil springs 19 extending between the axles 16 and 17 which tends to shorten the distance between those axles.

Locking means 20 is provided within the boom 10 to prevent upward movement of the boom and to restrain downwards movement about the mounting member 4. The locking means 20 comprises a rod 21 pivotally mounted to the upper channel 14 about the axle 17 and screw-threaded at its distal end 22. The locking means 20 also comprises a nut 23 which is pivotally mounted to the lower channel 13 about an axis 24 extending perpendicularly to the length of the rod 21. The nut 23 has a passage 25 therethrough which is of oversized diameter compared to the distal end 22 of the rod 21 and which has screw-threaded formations 26 therein to cooperate with the screw-thread on the rod in a locking condition in which the boom is prevented from upward movement and restrained from downward movement. The nut 23 is biased into the locking position by a compression spring 27 extending between the nut and a post 28 fixed to the lower channel 13.

In Figure 4, the compression spring 27 biases the nut 23 anticlockwise about axis 24 into the locking position in which the formations 26 at opposite ends of the passage 25 engage with the screw-thread on the distal end 22 of the rod 21. In this position, the axes of the passage 25 and distal end 22 are non-parallel and in order to release the locking means 20, the nut 23 must be pivoted clockwise about axis 24, to substantially align the axes of the passage 25 and of the distal end 22 whereby the distal end may move substantially freely through the passage 25.

Release means generally shown at 29 is provided to bias the nut 23 clockwise to move the nut out of its locking position. The release means 29 comprises a flexible wire 30 locked at one end in the post 28 by a locking screw 31 and extending through a coaxially flexible sheath 32 for fixed engagement with a lever assembly 33 mounted in the work surface 2. The flexible sheath 32 engages at one end with the nut 23 and extends through the boom 10 and support bracket 11 to engage at the other end a nut 34 defining the vertical pivot axis of the work surface 2. Bearing means 35 are provided to facilitate the pivotal movement. The flexible wire 30 projects from the one end of the sheath 32 through the nut 23, through the compression spring 27 to the post 28, and at the other end projects from the other end of the sheath through the nut 34 to be locked with the lever assembly 33. The lever assembly 33 comprises an arm 36 which is rigid with a pivot axle 37 from which extends a handle 38, shown in Figure 3, capable of upward and downward movement.

The locking means 20 is designed so that the work surface 2 may be lowered against the bias of the tension springs 19 and the friction in the locking means without moving the nut 23 out of its locking position by

means of the release means 29. Thus, a large downwards force applied to the work surface 2 will override the tension springs 19 and locking means 20 to permit the work surface 2 to be moved downwardly, as desired, with the locking means acting as a ratchet mechanism. The orientation of the nut 23 is defined by the compression spring 27 and the sheath 32, but in the uppermost position of the work surface 2, when the upper surfaces of the work surface and of the tabletop 1 are aligned, the right hand surface 39 (in Figure 4) of the nut 23 abuts the shoulder 40 between the distal end 22 of the rod 21 and the remainder thereof. Accordingly, in this condition it is not possible to pivot the nut 23 clockwise (in Figure 4) and lowering of the work surface 2 must be by means solely of downward pressure applied to the work surface. In any other condition, it is possible to release the locking means 20 to lower the work surface 2, as well as to raise the work surface.

In use, raising the handle 38 tends to compress the sheath 32 by shortening the length of flexible wire between the nut 23 and the nut 34, as shown generally in Figure 4. Accordingly, the sheath 32 biases the nut 23 clockwise against the bias of the compression spring 27 and against the frictional resistance in the screw-threaded cooperation between the nut and rod. In practice, because of the flexibility of the handle 38 and the bias of the two tension springs 19, although a turning force is applied to the nut 23 by the sheath 32, the locking position of the nut is not disengaged until the work surface 2 is pushed down slightly, adjusting the relative positions of the lower and upper channels 13 and 14 with the friction between the screw-threaded rod 21 and nut 23 causing the nut to rotate about its pivot axis 24 disengaging the threaded formations 26 on the nut from the threads on the distal end 22 of the rod, at which

point the tension in the raised handle 38 comes into action and with the bias in the sheath 32 displaces the nut 23 clockwise (in Figure 4) against the compression spring 27. The work surface 2 is now free to be raised or lowered by the operator while the handle 38 remains raised.

As soon as the handle 38 is released, the compression spring 27 forces the nut 23 into engagement with the screw-threaded rod 21, and if the downward force is removed from the work surface 2, the spring 27 forces the nut 23 into its locking position.

While one preferred embodiment of the present invention has been fully described herein, it will be appreciated that many modifications and variations may be put into effect while remaining within the scope of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A height adjustable support arm comprising a mounting member, boom means comprising two support members independently mounted at one end to the mounting member about parallel pivot axes for upwards and downwards pivotal movement one above the other, a support bracket pivotally mounted to each of the support members at their opposite end about pivot axes that are parallel to the first mentioned pivot axes whereby the support members must perform the upward and downward movement concurrently to raise and lower the support bracket relative to the mounting member, means biasing the opposite end of the lower of the support members towards the one end of the upper of the support members whereby the boom means is biased to raise the support bracket relative to the mounting member, locking means carried by the boom means to maintain the support bracket at a selected height and release means actuatable to disengage the locking means.

2. A support arm according to claim 1 wherein the locking means comprises a longitudinally serrated rod carried by one of the support members and a correspondingly internally formed nut engageable with the rod, with the corresponding formations in the nut being formed in a passage through the nut which is of oversized dimensions compared to the longitudinally serrated rod, and wherein the nut is pivotally mounted on the other of the support members about an axis perpendicular to the axis of the rod whereby the nut can be pivoted between a locking position in which the axis of the passage is misaligned with the axis of the rod and in which the serrations on the rod are engaged by the corresponding formations at opposite ends of the passage through the nut, and a release position in which the axes of the passage and of the rod are substantially parallel whereby the rod may be readily moved through the passage.

3. A support arm according to claim 2 wherein the nut is biased into the locking position and the release means is actuatable to move the nut into the release position.

4. A support arm according to claim 2 or claim 3 wherein the serrations on the rod and the corresponding formations in the passage comprise screw-threads.

5. A support arm according to claim 4 wherein one or both the screw-threads are discontinuous.

6. A support arm according to any one of claims 2 to 5 wherein the locking means comprises a ratchet mechanism whereby a greater than predetermined downwards pressure applied to the support bracket overrides the biasing means and the locking means.

7. A support arm according to any one of the preceding claims wherein the support members comprise upper and lower elongate U-shaped channels, with the lower channel opening upwardly and the upper channel being of larger cross-section than the lower channel and opening downwardly to partly overlie and define a housing with the lower channel.

8. A support arm according to claim 7 wherein the biasing means comprises at least one coil spring disposed in the housing and extending under tension between the one end of the upper channel and the opposite end of the lower channel.

9. A support arm according to any one of the preceding claims wherein the mounting member is pivotally mounted about a vertical axis.

10. A support arm according to claim 9 wherein the mounting member is pivotally mounted about said vertical axis to a carriage having rollers rotatable in a guide track.

11. A support arm according to any one of the preceding claims wherein the support bracket includes a vertical pivot support to receive a work surface in rotatable manner.

Fig. 8.

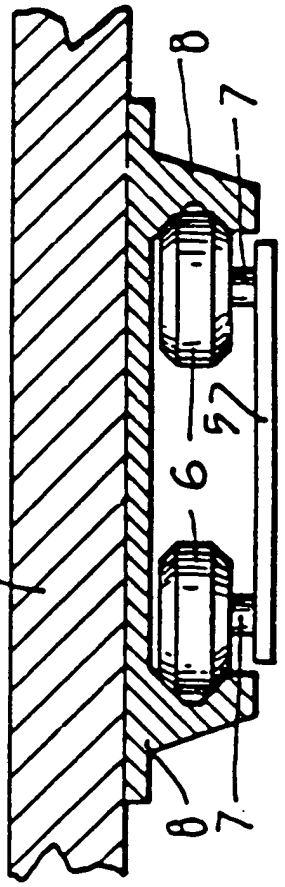
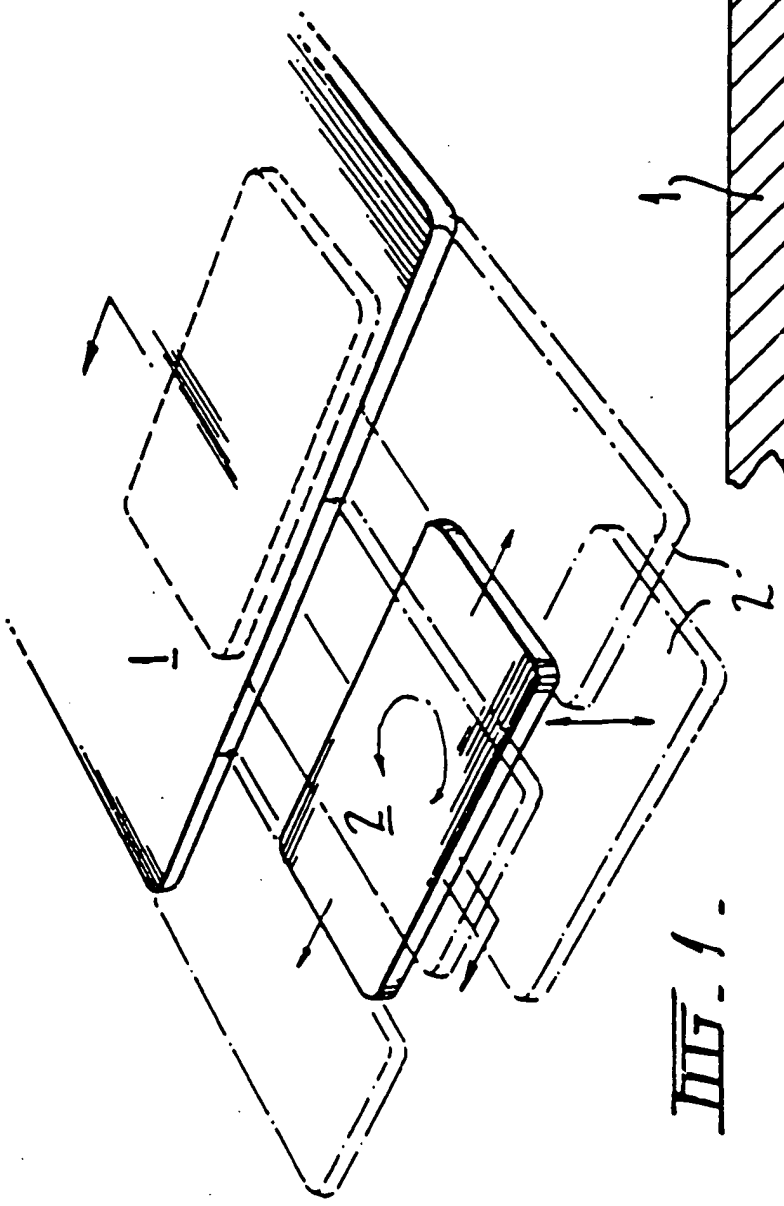


Fig. 1.



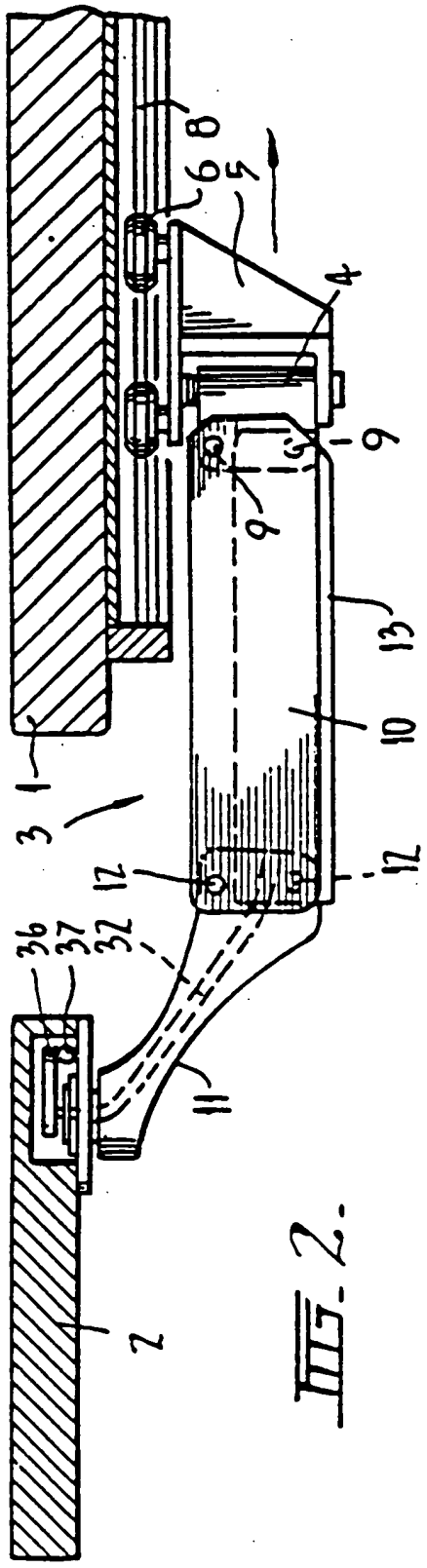


Fig. 2.

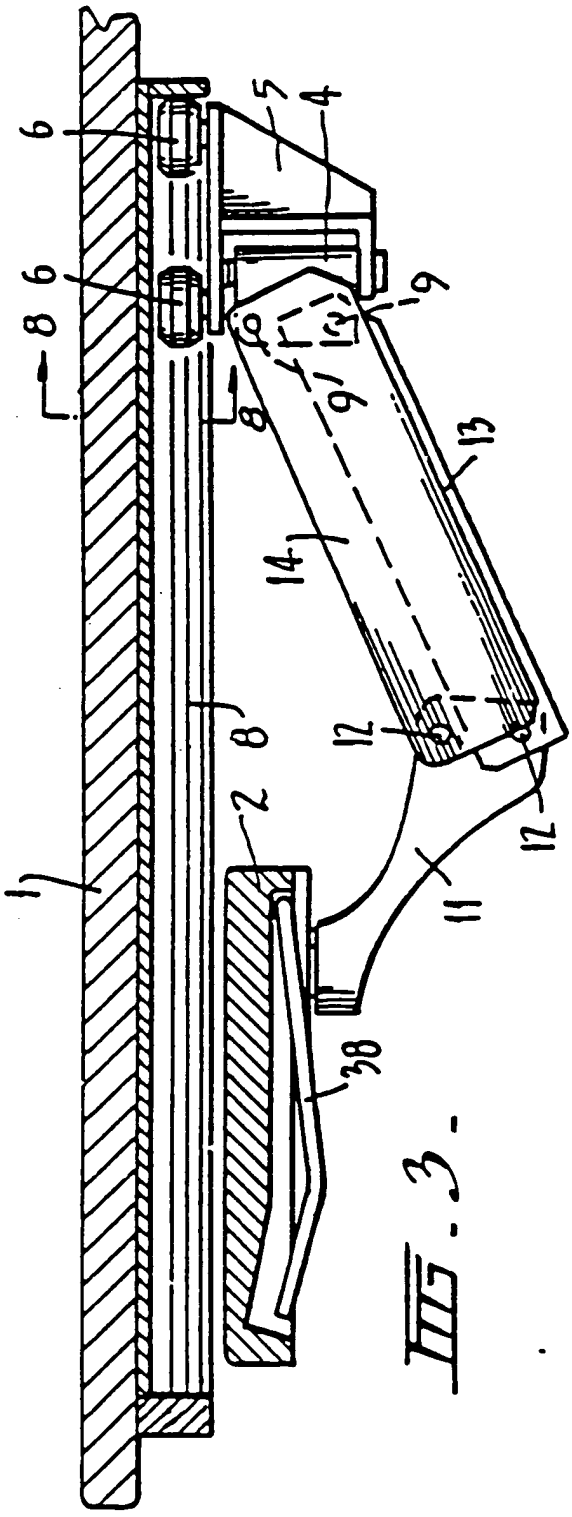


Fig. 3.

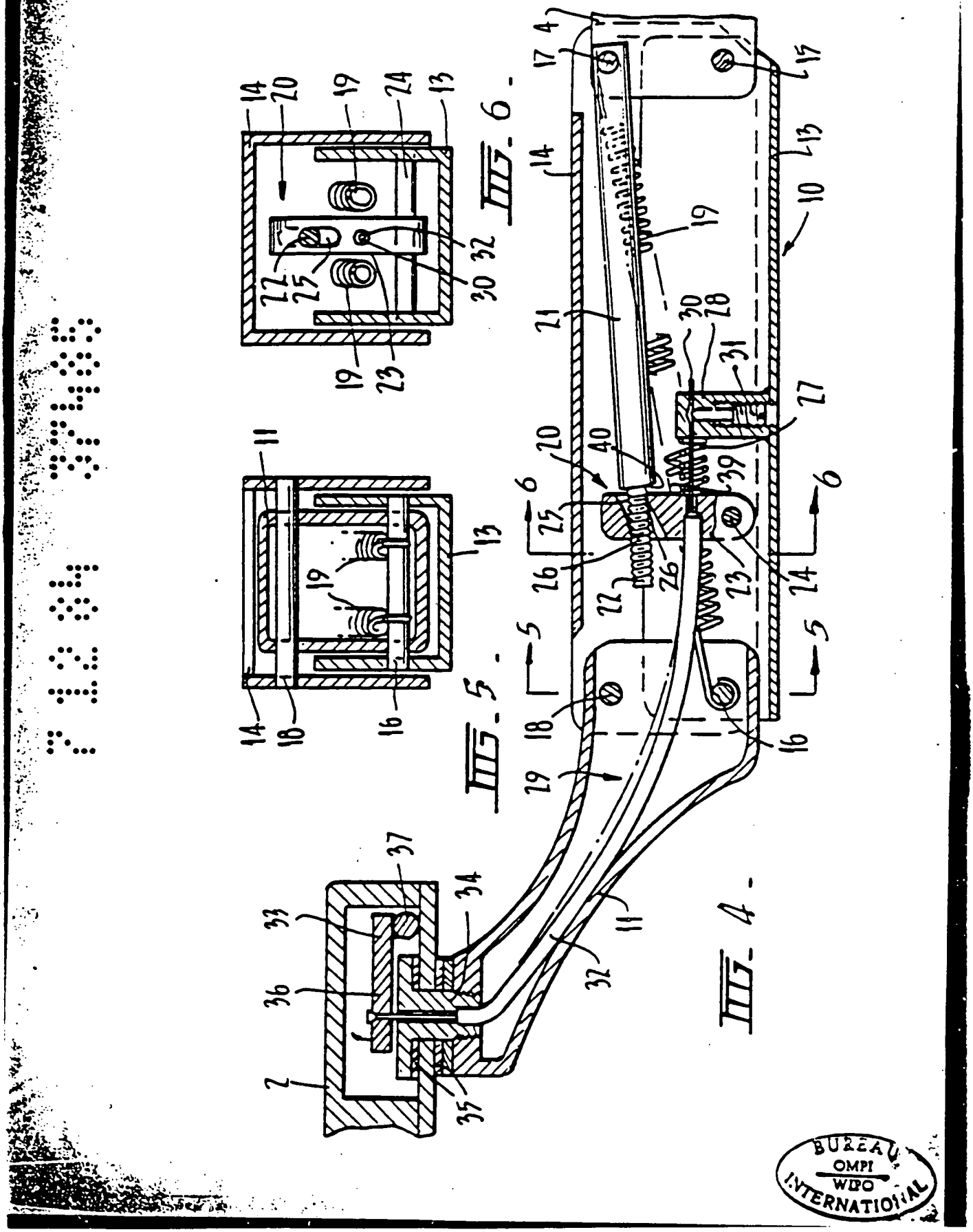


FIG. 6.

FIG. 5.

FIG. 4.

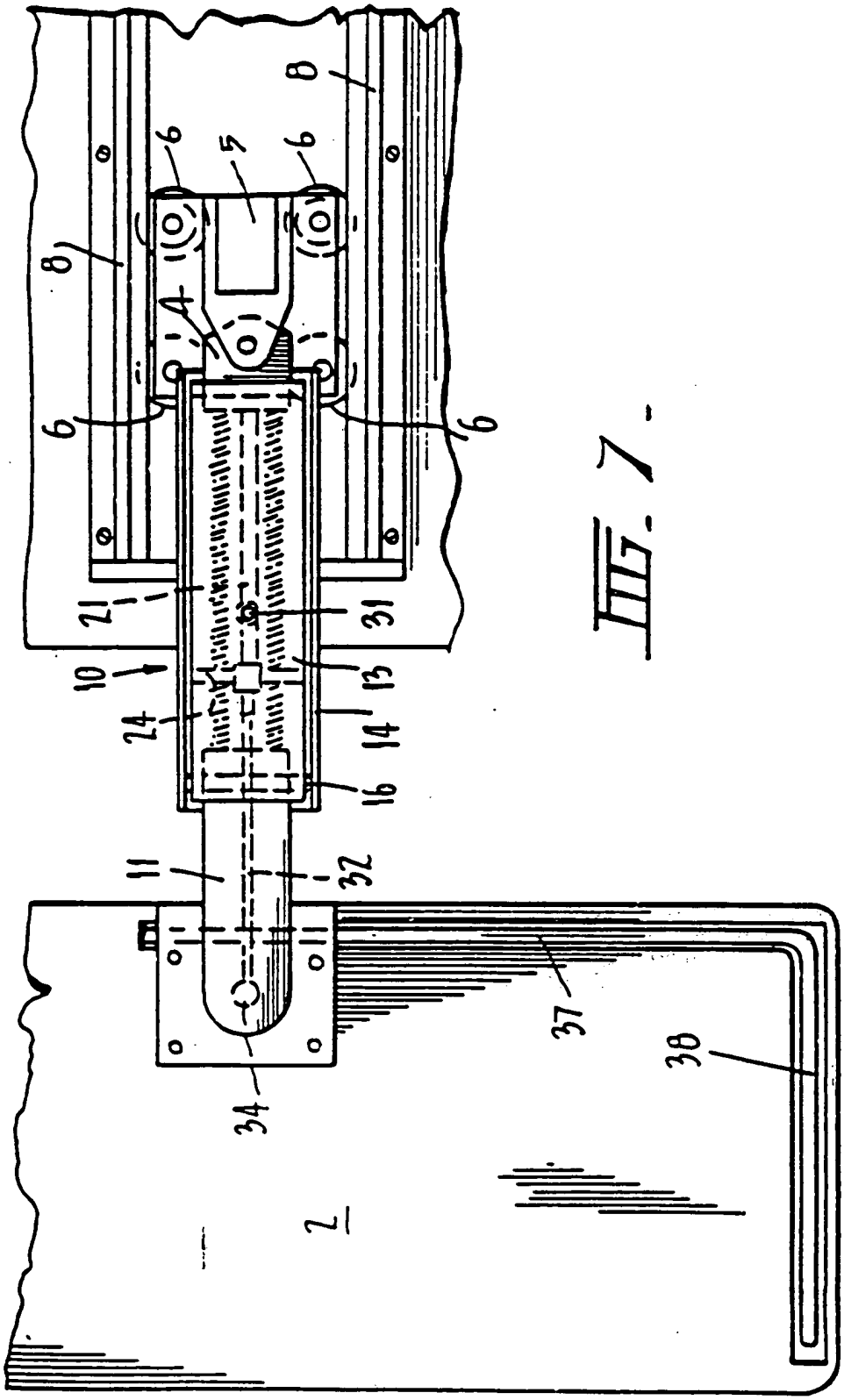


FIG. 7.

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 84/00254

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[3] A47B 17/03, 21/00, 21/03, F16M 11/12

II. FIELDS SEARCHED

Minimum Documentation Searched

Classification System	Classification Symbols
IPC	A47B 17/03, 21/00, 21/03, F16M 11/12

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched

AU IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
P,X Y	EP, A, 096 373 (HAWORTH INC) 21 December 1983 (21.12.83)	(1) (2-11)
Y	US, A, 3 516 343 (TUNNEY) 17 August 1971 (17.08.71)	(1 to 11)
Y	US, A, 3 891 301 (HELLER) 6 May 1976 (06.05.76)	(1 to 11)
Y	US, A, 4 365 561 (TELLIER et al) 1 February 1983 (01.02.83)	(1 to 11)
Y	AU, B, 48536/59 (229003) 28 June 1960 (28.06.60)	(1 to 11)
A	EP, A, 38068 (SIEMENS Ag) 21 October 1981 (21.10.81)	(1 to 11)

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15 February 1984 (15.02.81)	(21.02.85) 21 FEBRUARY 1985
International Searching Authority	**Signature of Authorized Officer**
AUSTRALIAN PATENT OFFICE	A. Hendrickson

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 84/00254

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members					
EP 96373	JP 59002126					
US 3891301	AT 2112/73	CA 982102	CH 548568			
	DE 2320266	FR 2213558	GB 1400639			
	IT 1019549	JP 49060540				
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END OF ANNEX

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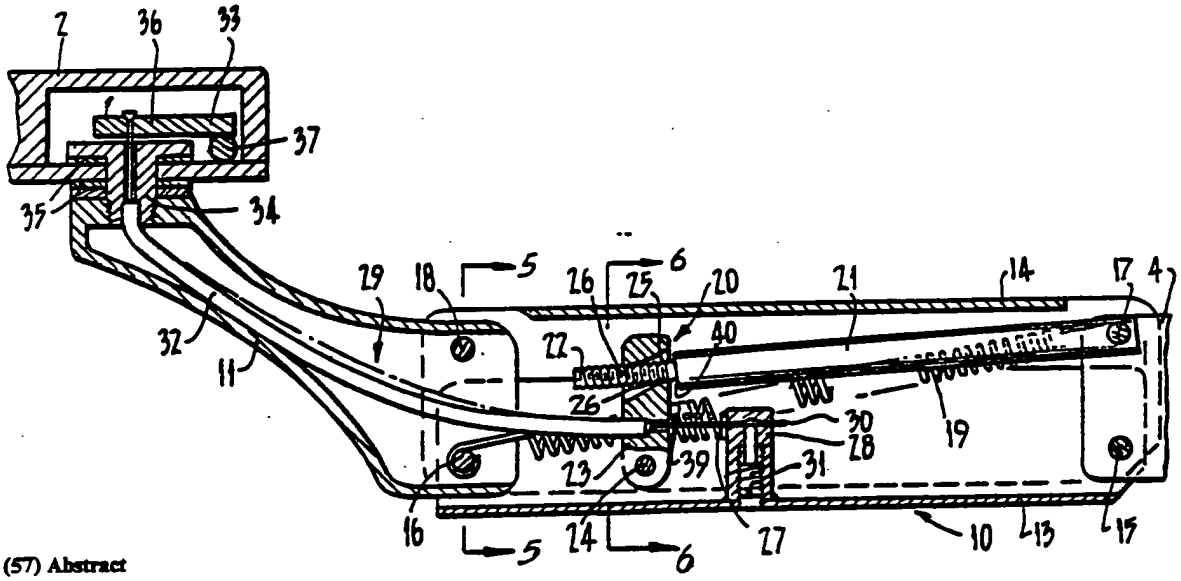

(57) Abstract

A height adjustable support arm preferably for use in mounting a separate work surface relative to a table top and comprising a boom (10) having two support members (13, 14) independently mounted at one end about parallel pivot pins (15, 17) for movement one above the other, a bracket (11) pivotally mounted (at 16, 18) about parallel axes to the other end of the support members, springs (19) biasing the other end of the lower support member towards the one end of the upper support member and locking means (20) to secure the boom at the desired height with the locking means being in the form of a serrated rod (21) which engages with a pivoted nut (23) which is biased so that a passage (25) in the nut through which the rod passes is normally misaligned with the rod and thereby engages the rod. Release means (29) is actuatable to adjust the disposition of the nut.

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HEIGHT ADJUSTABLE SUPPORT ARM

The present invention relates to height adjustable support arms and is particularly, but not only, concerned with a table having a separate work surface mounted thereto whose height is adjustable relative to the tabletop.

Over many years there have been numerous proposals for providing tables with work surfaces that are adjustable as to height in order to satisfactorily accommodate people of different sizes and different uses. The tables having separate work surfaces which are adjustable as to height have particularly come to the

fore with the introduction of tabletop computers and similar electronic apparatus in which medical advantages have been found to accrue from having for example a display screen at a different height to a keyboard.

According to the present invention there is provided a height adjustable support arm comprising a mounting member, boom means comprising two support members independently mounted at one end to the mounting member about parallel pivot axes for upwards and downwards pivotal movement one above the other, a support bracket pivotally mounted to each of the support members at their opposite end about pivot axes that are parallel to the first mentioned pivot axes whereby the support members must perform the upward and downward movement concurrently to raise and lower the support bracket relative to the mounting member, means biasing the opposite end of the lower of the support members towards the one end of the upper of the support members whereby the boom means is biased to raise the support bracket relative to the mounting member, locking means carried by the boom means to maintain the support bracket at a selected height and release means actuatable to disengage the locking means.

In a preferred embodiment, the locking means comprises a longitudinally serrated rod carried by one of the support members and a correspondingly internally formed nut engageable with the rod. The corresponding formations in the nut are formed in a passage through the nut which is of oversized dimensions compared to the longitudinally serrated rod and the nut is pivotally mounted on the other of the support members about an axis perpendicular to the axis of the rod whereby the nut can be pivoted between a locking position in which the axis of the passage is misaligned with the axis of the rod and in which the serrations on the rod are engaged by the

corresponding formations at opposite ends of the passage through the nut, and a release position in which the axes of the passage and of the rod are substantially parallel whereby the rod may be readily moved through the passage. The nut is preferably biased into the locking position and the release means is actuatable to move the nut into the release position. Conveniently, the serrations on the rod and the corresponding formations in the passage comprise screw-threads, but the screw-thread in the passage need only be sufficient to ensure locking engagement with the rod in the locking position.

Accordingly the locking means prevents upward displacement of the support bracket relative to the mounting means when the locking nut is in its locking position, and preferably the locking means is in the form of a ratchet arrangement whereby it is not necessary to actuate the release means to lower the support bracket relative to the mounting member. Thus manually applied downwards pressure on the support bracket may cause the support bracket to lower, but advantageously the upwards biasing caused by the biasing means, which is preferably in the form of at least one tensioned coil spring, and the frictional resistance in the locking means is such that the downwards force to be applied to the support bracket must be greater than would normally be applied during use. Thus, the downwards force must be greater than, for example, the mass of a keyboard and any other such mass usually applied to the support bracket. In the preferred embodiment, the aforementioned ratchet means may be such that the screw-threads in the nut slide over the screw-threads on the rod to permit the downwards movement of the support bracket.

Alternatively the ratchet mechanism may be designed such that it permits upwards movement of the support bracket, with downwards movement only being allowed when the locking means is released.

One embodiment of a support arm in accordance with the present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a perspective view from above of a tabletop and work surface which are connected by the support arm;

Figure 2 is a side view showing the work surface at its maximum height relative to the tabletop;

Figure 3 is a view similar to Figure 2 but showing the work surface stored beneath the tabletop;

Figure 4 is an enlarged sectional view of part of Figure 2 showing the internal arrangement of the support arm;

Figure 5 is a sectional view along the line 5-5 of Figure 4;

Figure 6 is a sectional view along the line 6-6 of Figure 4;

Figure 7 is a view of the tabletop, support arm and work surface of Figure 2 from below, partly in section; and

Figure 8 is a sectional view along the line 8-8 in Figure 3.

The table shown in Figure 1 comprises a tabletop 1 and a work surface 2 which is moveable from a retracted position beneath the tabletop shown in dotted lines to an extended position shown in continuous lines by means of a support arm to be described in greater detail hereinafter. In the extended position, the work surface is rotatable through 360° about its own axis, is displaceable sideways relative to the tabletop and is moveable upwards and downwards relative to the tabletop.

Referring now to Figures 2, 7 and 8, the support arm 3 comprises a mounting member 4 which is pivotally mounted about a vertical axis to a carriage 5 which carries rollers 6 rotatable about vertical axles 7 in a guide track 8 mounted on the lower surface of the tabletop 1.

Pivotally mounted to the mounting member 4 about horizontal axes 9, and in a manner to be described in greater detail hereinafter, is a boom 10. A support bracket 11 is pivotally mounted about axes 12 to the opposite end of the boom to the axes 9, also in a manner to be described in greater detail hereinafter. The work surface 2 is pivotally mounted to the remote end of the bracket 11 for rotation about a vertical axis. In summary, the carriage 5 may be displaced along the track 8 to extend and retract the work surface 2, the boom 10 may be pivoted relative to the carriage 5 about a vertical axis and the work surface 2 may be pivoted relative to the support bracket 11 also about a vertical axis. In addition, the work surface 2 is moveable upwardly and downwardly relative to the tabletop 1 by pivotally movement about the horizontal axes 9 and 12.

As indicated in Figure 2, when the work surface 2 is raised to its maximum height 1, with the upper surfaces of each aligned, the horizontal axes 9 are vertically spaced from each other, and the horizontal axes 12 are also vertically spaced from each other. Referring now to Figure 3, which shows the work surface in a lowered position, the boom 10 is arranged such that the horizontal axes 9 are still vertically spaced from each other, as are the horizontal axes 12. Thus the boom 10 defines a parallelogram arrangement between the axes 9 and 12 whereby the upper surface of the work surface 2 is maintained at the desired angle, horizontal as shown in the figures.

Referring now to Figures 4 to 7, the boom 10 comprises a lower elongate U-shaped channel 13 which opens upwardly and an upper elongate U-shaped channel 14 which is of larger cross-section than the lower channel 13 and opens downwardly to partly overlie the lower channel. The lower channel 13 is pivotally engaged with the mounting member 4 by means of an axle 15 which defines the lower horizontal axis 9 and is pivotally engaged with the support bracket 11 by a pivot axle 16 which defines the lower horizontal axis 12. Correspondingly, the upper channel is pivotally engaged with the mounting member 4 by a pivot axle 17 which defines the upper horizontal pivot axis 9 and with the support bracket 11 by a pivot axle 18 which defines the upper horizontal axis 12.

The boom 10 is biased upwardly relative to the mounting member 4 by a pair of tensioned coil springs 19 extending between the axles 16 and 17 which tends to shorten the distance between those axles.

Locking means 20 is provided within the boom 10 to prevent upward movement of the boom and to restrain downwards movement about the mounting member 4. The locking means 20 comprises a rod 21 pivotally mounted to the upper channel 14 about the axle 17 and screw-threaded at its distal end 22. The locking means 20 also comprises a nut 23 which is pivotally mounted to the lower channel 13 about an axis 24 extending perpendicularly to the length of the rod 21. The nut 23 has a passage 25 therethrough which is of oversized diameter compared to the distal end 22 of the rod 21 and which has screw-threaded formations 26 therein to cooperate with the screw-thread on the rod in a locking condition in which the boom is prevented from upward movement and restrained from downward movement. The nut 23 is biased into the locking position by a compression spring 27 extending between the nut and a post 28 fixed to the lower channel 13.

In Figure 4, the compression spring 27 biases the nut 23 anticlockwise about axis 24 into the locking position in which the formations 26 at opposite ends of the passage 25 engage with the screw-thread on the distal end 22 of the rod 21. In this position, the axes of the passage 25 and distal end 22 are non-parallel and in order to release the locking means 20, the nut 23 must be pivoted clockwise about axis 24, to substantially align the axes of the passage 25 and of the distal end 22 whereby the distal end may move substantially freely through the passage 25.

Release means generally shown at 29 is provided to bias the nut 23 clockwise to move the nut out of its locking position. The release means 29 comprises a flexible wire 30 locked at one end in the post 28 by a locking screw 31 and extending through a coaxially flexible sheath 32 for fixed engagement with a lever assembly 33 mounted in the work surface 2. The flexible sheath 32 engages at one end with the nut 23 and extends through the boom 10 and support bracket 11 to engage at the other end a nut 34 defining the vertical pivot axis of the work surface 2. Bearing means 35 are provided to facilitate the pivotal movement. The flexible wire 30 projects from the one end of the sheath 32 through the nut 23, through the compression spring 27 to the post 28, and at the other end projects from the other end of the sheath through the nut 34 to be locked with the lever assembly 33. The lever assembly 33 comprises an arm 36 which is rigid with a pivot axle 37 from which extends a handle 38, shown in Figure 3, capable of upward and downward movement.

The locking means 20 is designed so that the work surface 2 may be lowered against the bias of the tension springs 19 and the friction in the locking means without moving the nut 23 out of its locking position by

means of the release means 29. Thus, a large downwards force applied to the work surface 2 will override the tension springs 19 and locking means 20 to permit the work surface 2 to be moved downwardly, as desired, with the locking means acting as a ratchet mechanism. The orientation of the nut 23 is defined by the compression spring 27 and the sheath 32, but in the uppermost position of the work surface 2, when the upper surfaces of the work surface and of the tabletop 1 are aligned, the right hand surface 39 (in Figure 4) of the nut 23 abuts the shoulder 40 between the distal end 22 of the rod 21 and the remainder thereof. Accordingly, in this condition it is not possible to pivot the nut 23 clockwise (in Figure 4) and lowering of the work surface 2 must be by means solely of downward pressure applied to the work surface. In any other condition, it is possible to release the locking means 20 to lower the work surface 2, as well as to raise the work surface.

In use, raising the handle 38 tends to compress the sheath 32 by shortening the length of flexible wire between the nut 23 and the nut 34, as shown generally in Figure 4. Accordingly, the sheath 32 biases the nut 23 clockwise against the bias of the compression spring 27 and against the frictional resistance in the screw-threaded cooperation between the nut and rod. In practice, because of the flexibility of the handle 38 and the bias of the two tension springs 19, although a turning force is applied to the nut 23 by the sheath 32, the locking position of the nut is not disengaged until the work surface 2 is pushed down slightly, adjusting the relative positions of the lower and upper channels 13 and 14 with the friction between the screw-threaded rod 21 and nut 23 causing the nut to rotate about its pivot axis 24 disengaging the threaded formations 26 on the nut from the threads on the distal end 22 of the rod, at which

point the tension in the raised handle 38 comes into action and with the bias in the sheath 32 displaces the nut 23 clockwise (in Figure 4) against the compression spring 27. The work surface 2 is now free to be raised or lowered by the operator while the handle 38 remains raised.

As soon as the handle 38 is released, the compression spring 27 forces the nut 23 into engagement with the screw-threaded rod 21, and if the downward force is removed from the work surface 2, the spring 27 forces the nut 23 into its locking position.

While one preferred embodiment of the present invention has been fully described herein, it will be appreciated that many modifications and variations may be put into effect while remaining within the scope of the invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A height adjustable support arm comprising a mounting member, boom means comprising two support members independently mounted at one end to the mounting member about parallel pivot axes for upwards and downwards pivotal movement one above the other, a support bracket pivotally mounted to each of the support members at their opposite end about pivot axes that are parallel to the first mentioned pivot axes whereby the support members must perform the upward and downward movement concurrently to raise and lower the support bracket relative to the mounting member, means biasing the opposite end of the lower of the support members towards the one end of the upper of the support members whereby the boom means is biased to raise the support bracket relative to the mounting member, locking means carried by the boom means to maintain the support bracket at a selected height and release means actuatable to disengage the locking means.

2. A support arm according to claim 1 wherein the locking means comprises a longitudinally serrated rod carried by one of the support members and a correspondingly internally formed nut engageable with the rod, with the corresponding formations in the nut being formed in a passage through the nut which is of oversized dimensions compared to the longitudinally serrated rod, and wherein the nut is pivotally mounted on the other of the support members about an axis perpendicular to the axis of the rod whereby the nut can be pivoted between a locking position in which the axis of the passage is misaligned with the axis of the rod and in which the serrations on the rod are engaged by the corresponding formations at opposite ends of the passage through the nut, and a release position in which the axes of the passage and of the rod are substantially parallel whereby the rod may be readily moved through the passage.

3. A support arm according to claim 2 wherein the nut is biased into the locking position and the release means is actuatable to move the nut into the release position.

4. A support arm according to claim 2 or claim 3 wherein the serrations on the rod and the corresponding formations in the passage comprise screw-threads.

5. A support arm according to claim 4 wherein one or both the screw-threads are discontinuous.

6. A support arm according to any one of claims 2 to 5 wherein the locking means comprises a ratchet mechanism whereby a greater than predetermined downwards pressure applied to the support bracket overrides the biasing means and the locking means.

7. A support arm according to any one of the preceding claims wherein the support members comprise upper and lower elongate U-shaped channels, with the lower channel opening upwardly and the upper channel being of larger cross-section than the lower channel and opening downwardly to partly overlie and define a housing with the lower channel.

8. A support arm according to claim 7 wherein the biasing means comprises at least one coil spring disposed in the housing and extending under tension between the one end of the upper channel and the opposite end of the lower channel.

9. A support arm according to any one of the preceding claims wherein the mounting member is pivotally mounted about a vertical axis.

10. A support arm according to claim 9 wherein the mounting member is pivotally mounted about said vertical axis to a carriage having rollers rotatable in a guide track.

11. A support arm according to any one of the preceding claims wherein the support bracket includes a vertical pivot support to receive a work surface in rotatable manner.

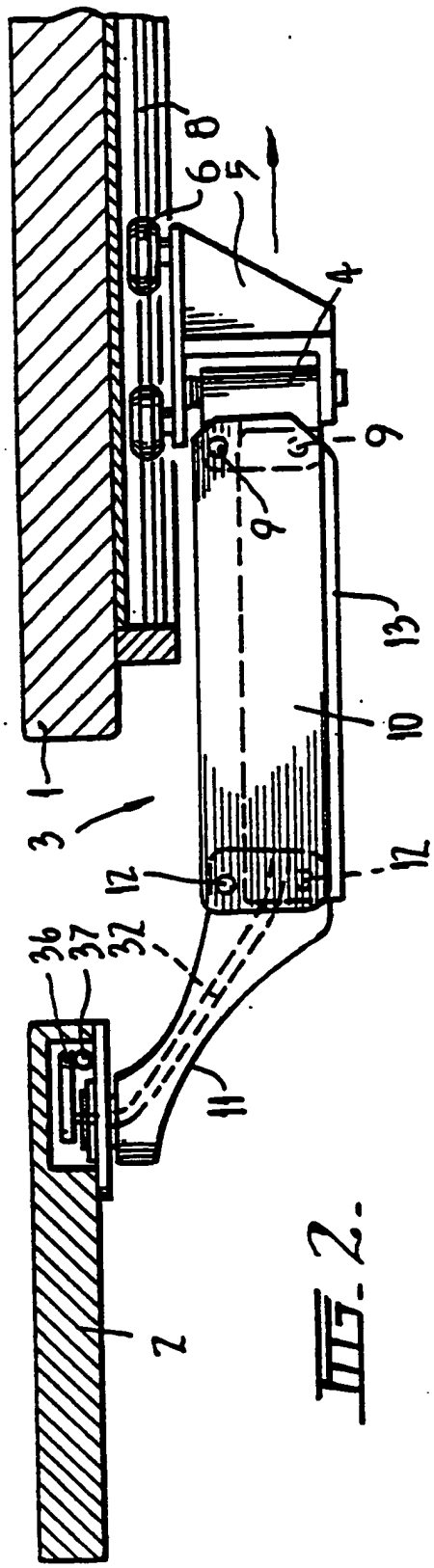

Fig. 2.

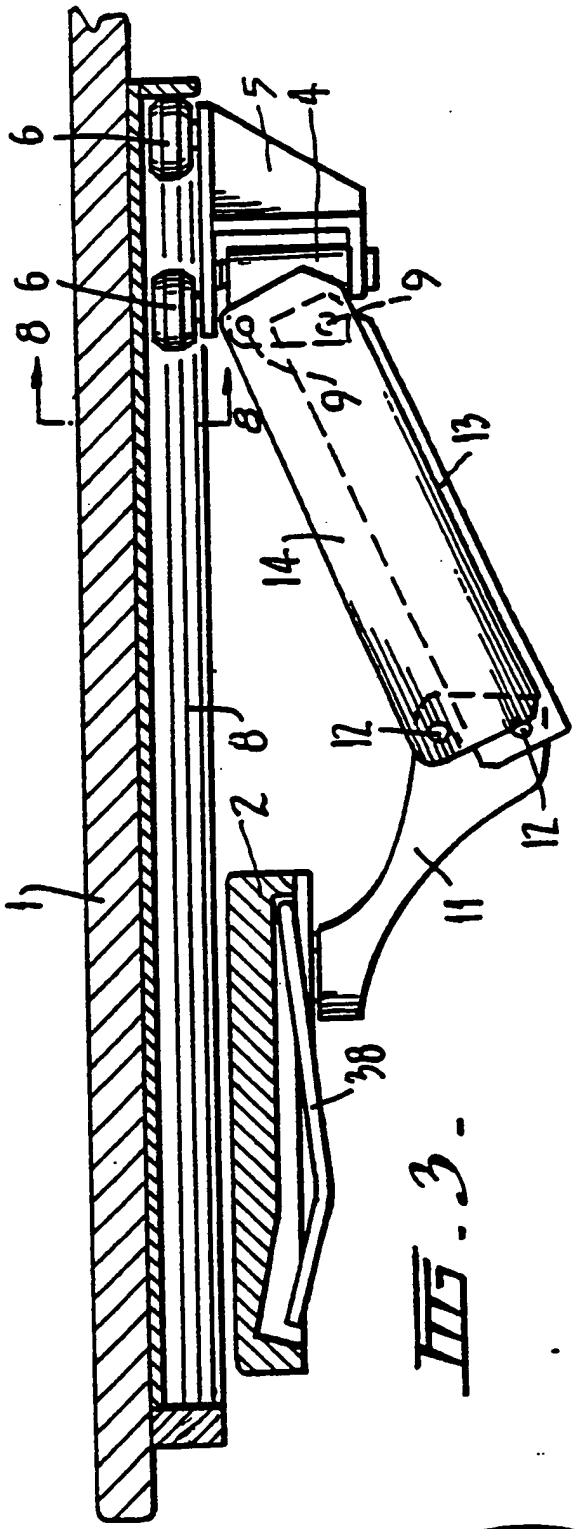

Fig. 3.

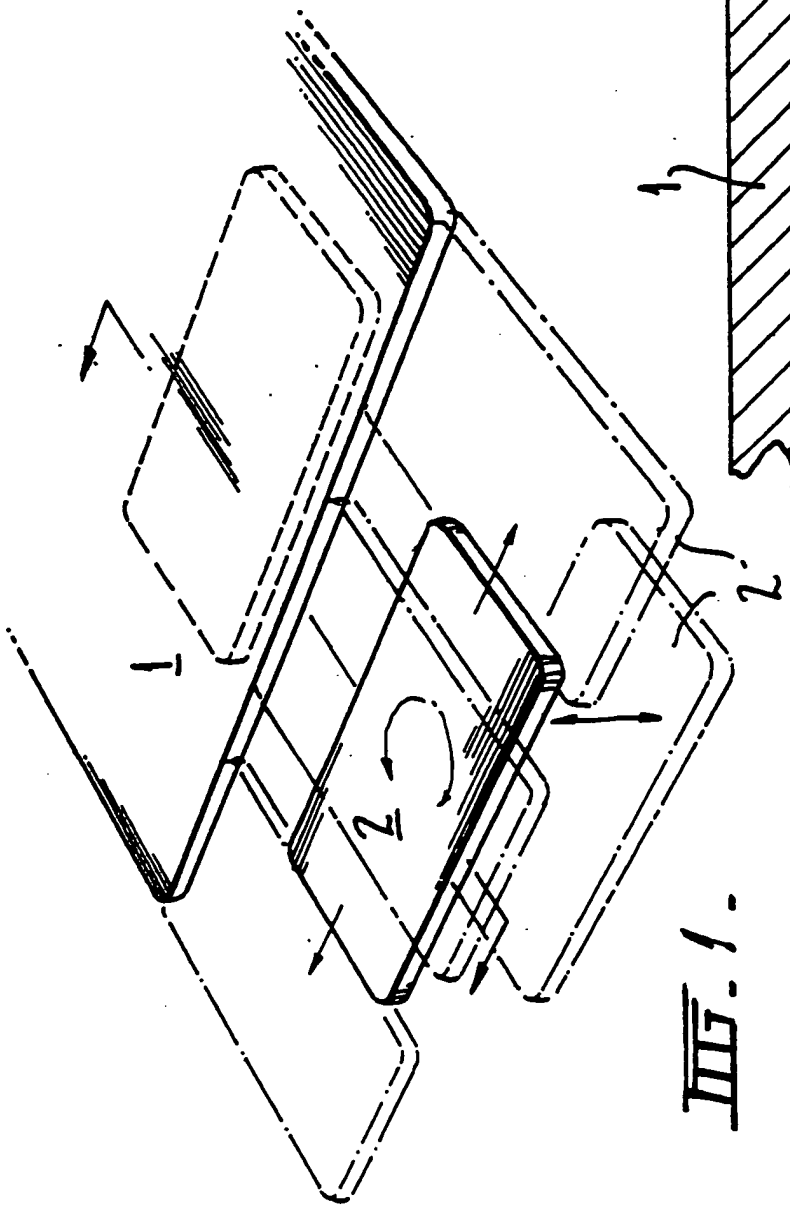

Fig. 1.

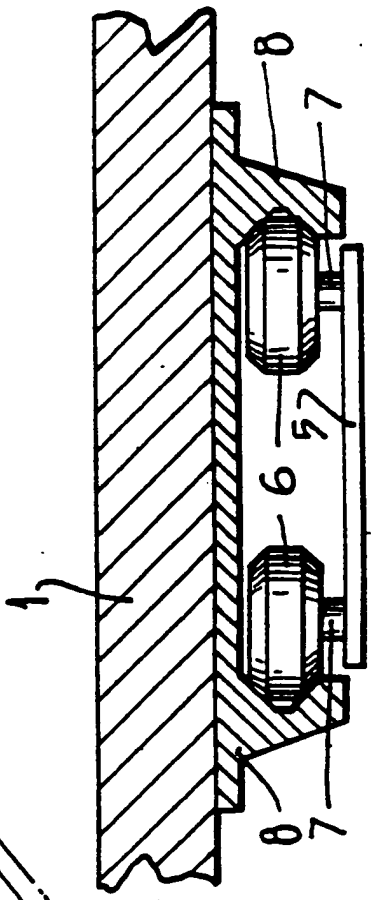

Fig. 8.

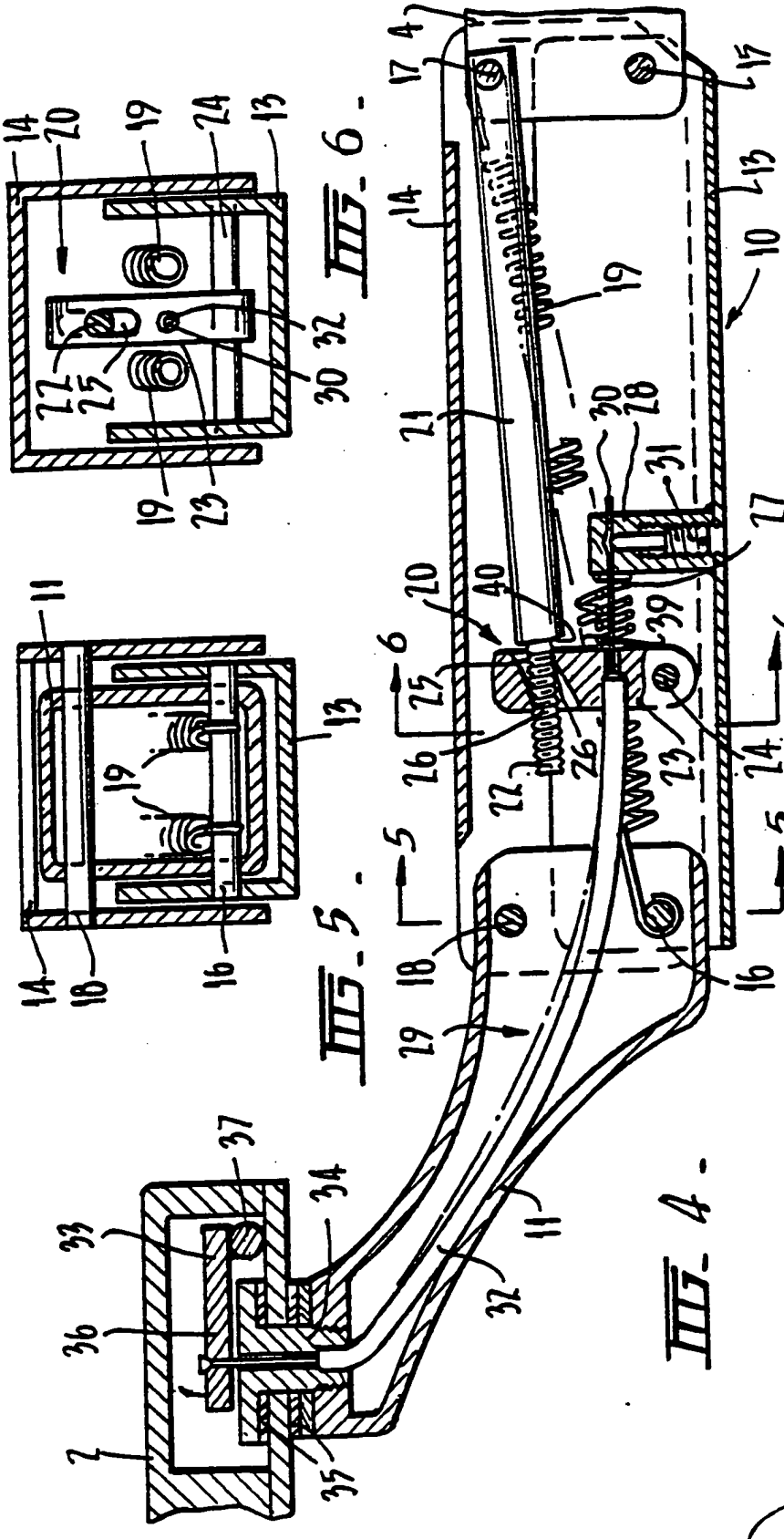

FIG. 6.

FIG. 5.

FIG. 4.

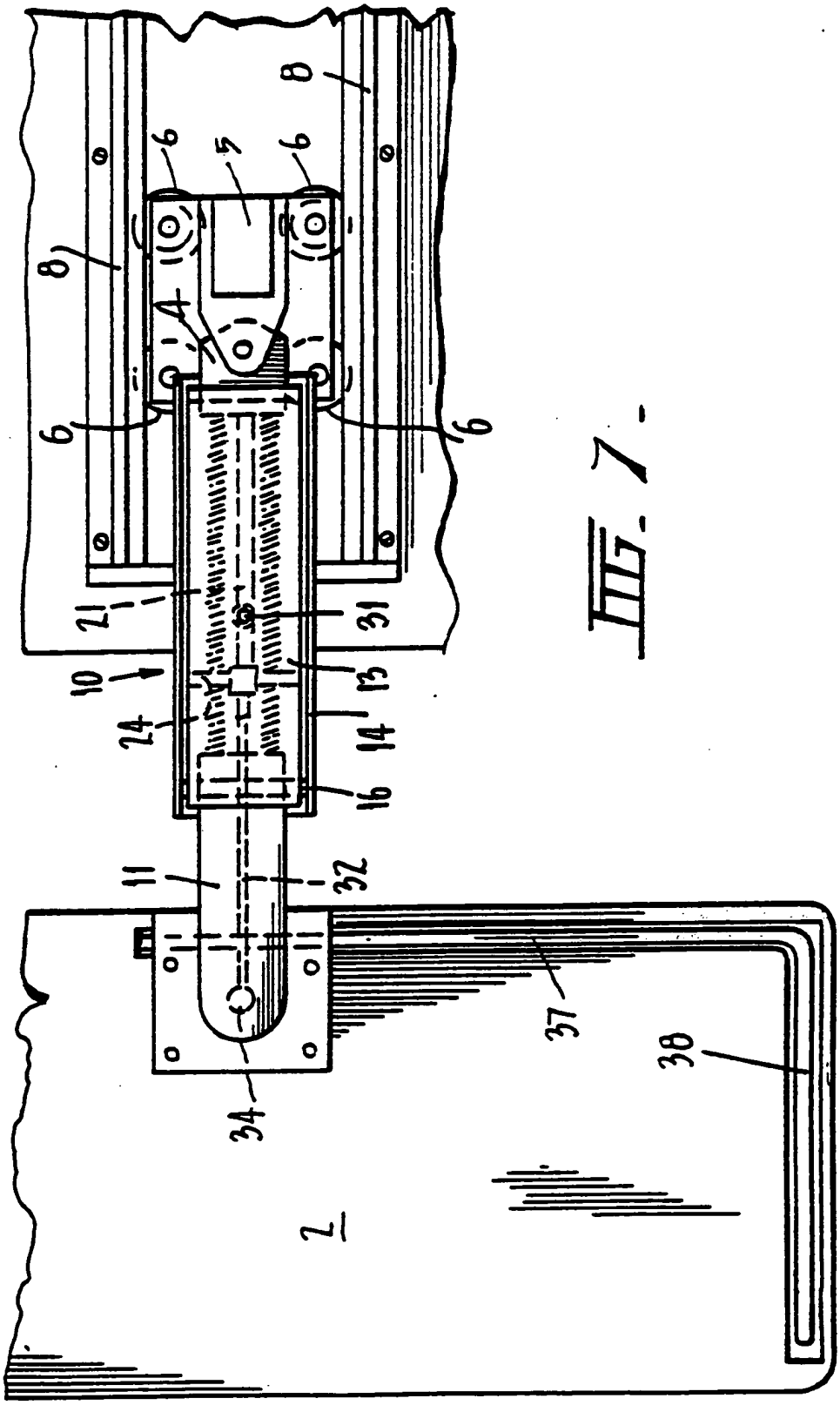

FIG. 1.

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 84/00254

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[3] A47B 17/03, 21/00, 21/03, F16M 11/12

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	A47B 17/03, 21/00, 21/03, F16M 11/12

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU	IPC as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
P X Y	EP, A, 096 373 (HAWORTH INC) 21 December 1983 (21.12.83)	(1) (2-11)
Y	US, A, 3 516 343 (TUNNEY) 17 August 1971 (17.08.71)	(1 to 11)
Y	US, A, 3 891 301 (HELLER) 6 May 1976 (06.05.76)	(1 to 11)
Y	US, A, 4 365 561 (TELLIER et al) 1 February 1983 (01.02.83)	(1 to 11)
Y	AU, B, 48536/59 (229003) 28 June 1960 (28.06.60)	(1 to 11)
A	EP, A, 38068 (SIEMENS Ag) 21 October 1981 (21.10.81)	(1 to 11)

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15 February 1984 (15.02.81)	(21.02.85) 21 FEBRUARY 1985
International Searching Authority	**Signature of Authorized Officer**
AUSTRALIAN PATENT OFFICE	A. Hendrickson

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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 84/00254

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Members			
EP 96373	JP 59002126			
US 3891301	AT 2112/73	CA 982102	CH 548568	
	DE 2320266	FR 2213558	GB 1400639	
	IT 1019549	JP 49060540		
US 4365561	EP 10491	FR 2438444	FR 2446514	
EP 38068	CA 1160723	DE 3014478	JP 57027774	

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